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19. ABSTRACT (Continue on reverse if necessary and identify by block number)  A Gordon Research Conference on Glass was held at Tilton School 1-5 August 1988. There were 80 attendees. A broad range of topics were covered related to the structure of glass and its effect on properties. A long-standing controversy between the advocates of mode-coupling viscosity and activation viscosity models was resolved. There were 20 speakers who were recognized leaders in their technology areas. There were 15 poster papers on diverse topics.			
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Final Report

Air Force Office of Scientific Research

Gordon Research Conference on Glass

August 1-5, 1988

Tilton School, Tilton, New Hampshire

Submitted by:

Joseph H. Simmons, Chairman  
University of Florida  
Gainesville, FL 32611



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The Gordon Research Conference on Glass was conducted August 1 to 5, 1988. The subject emphasized was: **THE STRUCTURE OF GLASS AND ITS EFFECT ON PROPERTIES**. There were 20 oral presentations and 15 poster papers. Speakers were from the US, Canada, France, Great Britain, Germany and Japan. There were 80 attendants.

The conference was judged most successful by all present. Of particular interest to everyone was the breadth of the field covered by the speakers and discussion leaders, and the assembly of different groups which do not usually meet together. Many new ideas were exchanged and long discussions continued well into the hot night.

Enclosed is a program of all the scheduled presentations. In general, most participants felt that this often neglected subject, yet of critical importance had received a new spark. A long-standing controversy between the advocates of mode-coupling viscosity and activation viscosity models was resolved. New fractal research in France received much attention. New NMR studies at Brown University promise much enlightenment in the structure of  $B_2O_3$ . Many participants claimed to have gained new insight in the understanding of glass structure. Hans Andersen claimed this to have been one of the best and most informative Gordon Conferences he's attended.

For my part, I learned a great deal, well justifying the effort to organize the Conference. The support received from AFOSR and other sponsors was absolutely critical to the success of the Conference. It is this support which allowed us to invite the top scientists of the field, many of whom could not have attended without financial help. This support was essential in a field which receives little glamour, attention and financial support at this time, but still remains one of the most critical areas in understanding the behavior of amorphous materials.

Gordon Research Conference on Glass

THE STRUCTURE OF GLASS AND ITS EFFECT ON PROPERTIES

Tilton Academy - August 1-5, 1988

Monday 9:00-12:00 AM

Discussion Leader: ROBERT EAGAN - Sandia National Laboratory

- ADRIAN WRIGHT
- The Use of Diffraction Data for Testing Structural Models of Amorphous Solids,
  - University of Reading, Reading, UK
- ROGER SINCLAIR
- Neutron Inelastic Scattering Studies of the Dynamics of Amorphous Solids,
  - Harwell Laboratories, Chilton, UK
- THOMAS SOULES
- Stochastic and MD Models of the Glass Structure,
  - General Electric Laboratories, Nela Park, Ohio, USA

Monday 7:30-9:30 PM

Discussion Leader: MARVIN WEBER, Lawrence Livermore National Laboratory

- NEVILLE GREAVES
- EXAFS and XANES Studies of the Structure of Glasses and Glass Surfaces,
  - SERC, Daresbury Laboratory, Daresbury, UK
- ITARU YASUI
- X-ray Diffraction and MD Structure Studies of the Structure of Glasses,
  - University of Tokyo, Tokyo, Japan

Tuesday 9:00-12:00 AM

Discussion Leader: GEORGE SCHERER - E. I. Dupont de Nemours, Co.

- JEAN-FRANÇOIS SADOE
- Topological Models and Curved Space Geometry for the Structure of Amorphous Materials,
  - Université de Paris Sud, Orsay, France
- RENÉ VACHER
- Fractal Studies of the Structure of Gels,
  - Université Des Sciences et Techniques du Languedoc, Montpellier, France
- ALEXANDER NAVROTSKY
- Relation Between Structure and Thermodynamics of Highly Metastable Silicates Made by CVD and Sol Gel,
  - Princeton University, Princeton, NJ, USA

Tuesday - Invited Posters 7:30-8:30 PM - Discussion of Posters 8:30-9:30 PM

Discussion Leader: JOHN MECHOLSKY - Pennsylvania State University

- THOMAS DICKINSON
- Fracto-Emission in Glass,
  - Washington State University, Pullman, WA, USA
- JOHN MECHOLSKY, JR.
- Precursors to Fracture Using Raman Spectroscopy,
  - Pennsylvania State University, University Park, PA, USA
- WILLIAM LACOURSE
- Relationship of Chalcogenide Structure to Mechanical Properties,
  - NYS College of Ceramics at Alfred University, Alfred, NY, USA
- DANN PASSOJA
- Role of Fractals in Scaling Fracture to Atomic Dimensions,
  - Pennsylvania State University, University Park, PA, USA
- STEPHEN GAROFALINI
- MD Simulations of Water Interactions with Silica,
  - Rutgers University, Camden, NJ, USA
- T. IWAGOSHI, P. K. GUPTA
- Theoretical Strength of Ionic Networks,
  - Ohio State University, Columbus, OH, USA
- R. K. BROW, Sandia National Lab.; R. J. KIRKPATRICK, University of Illinois;  
G. L. TURNER, Spectral Data Services
- Spectroscopic Investigations of the Structures of Sodium-Aluminophosphate Glasses
- J. F. EMERSON, P. E. STALLWORTH, S. J. GRAVINA and P. J. BRAY,
- NMR and NQR Studies of Glass Structure,
  - Brown University, Providence, RI, USA

Wednesday 9:00-12:00 AM

Discussion Leader: ADRIAN WRIGHT - J. J. Thompson Physical Laboratory,  
University of Reading

- HANS ANDERSEN
- Molecular Dynamics Simulation of the Glass Transition,
  - Stanford University, Stanford, CA, USA
- JAMES DUFTY
- Hydrodynamic Models of the Glass Transition,
  - University of Florida, Gainesville, FL, USA
- GARY GREEST
- Modeling of the Glass Transition,
  - Exxon Research and Engineering, Annandale, NJ, USA

Wednesday 7:30-9:30 PM

Discussion Leader: JAMES SHELBY - NYS College of Ceramics  
at Alfred University

- STEPHEN ELLIOTT
- Chalcogenides, Medium Range Structure and Photo-structural Effects,
  - Cambridge University, Cambridge, UK
- DELBERT DAY
- Structure and Properties of Phosphorous Oxynitride Glasses,
  - University of Missouri, Rolla, Missouri, USA

Thursday 9:00-12:00 AM

Discussion Leader: PHIL BRAY - Brown University

- JAMES KIRKPATRICK
- High Resolution NMR Spectroscopy of Glasses
  - University of Illinois, Urbana, IL, USA
- RAY DUPREE
- Magic Angle Spinning NMR Studies of Glass,
  - University of Warwick, Coventry, UK
- AUSTEN ANGELL
- Effect of Structure on Transport Properties of Glasses,
  - Purdue University, West Lafayette, IN, USA

Thursday 4:00-6:00 PM - Poster Session (Hamilton Hall)  
(see attached list of presentations)

Thursday 6:00 PM - Banquet

Thursday 7:30 PM

Discussion Leader: NORBERT KREIDL

- LARRY HENCH
- Biologically Active Glasses and the Origin of Life,
  - University of Florida, Gainesville, FL, USA

Friday 9:00-12:00 AM

Discussion Leader: JOSEPH H. SIMMONS, University of Florida

- MARVIN WEBER
- Optical Studies of the Structure of Glass,
  - Lawrence Livermore National Laboratory, Livermore, CA, USA
- EVA VOGEL
- Effect of Structure and Composition on Non-Linear Optical Properties of Oxide Glasses,
  - Bell Communications Research, Red Bank, NJ, USA
- FRANK GALEENER
- Range of Order and Vibrational Spectroscopy of Glass Structure,
  - Colorado State University, Fort Collins, CO, USA

Thursday Poster Session - Hamilton Hall 4:00-6:00 PM

- J. FORTNER, J. S. LANIN - Short Range Order Variations in Non-Crystalline Si and Ge and the Relation to Physical Property Modifications,  
- Pennsylvania State University, University Park, PA, USA
- P. BOOLCHAND - Medium Range Order in Chalcogenide Glasses from Mossbauer Spectroscopy,  
- University of Cincinnati, Cincinnati, OH, USA
- C. C. PHIFER, D. J. GOSZTOLA, C. A. ANGELL - Structural Interpretation of Raman Spectra of Fluorozirconate Glass,  
- Purdue University, West Lafayette, IN, USA
- J. KIEFFER, C. A. ANGELL - Structure and Dynamics of Fractal Low Density Silica,  
- Purdue University, West Lafayette, IN, USA
- T. SWILER, J. SIMMONS, R. OCHOA - MD Studies of Mechanical Failure in  $\text{SiO}_2$ ,  
- University of Florida, Gainesville, FL, USA